THE INVENTION CLAIMED IS:

1. An apparatus for restricting axial flow through the clearance between a rotating shaft and a seal stator and providing effective damping to improve rotor stability, comprising:

an abradable labyrinth seal and swirl-reversal vanes upstream of the labyrinth seal.

2. An apparatus according to claim 1, wherein the shaft comprises a first toothed axial section having a plurality of annular teeth, a second upstream toothed axial section having a few annular teeth from one to three and a section therebetween having a cylindrical surface of diameter less than the outer edge of the teeth of the toothed sections, the swirl-reversing vanes being fastened to the stator seal between the toothed sections.

3. An apparatus according to claim 1 or 2, wherein there is a smooth abradable coating on surface of the stator seal radially outward of the first toothed section.

4. The apparatus according to claim 1 or 2, wherein the vanes have a generally v-shape with a generally v-shaped slot therebetween, the apex of the slot being circumferentially pointed in the direction of shaft rotation whereby the axial gas flow swirling in the rotational direction of the shaft enters the slots and is redirected to exit swirling in the direction against the rotation of the shaft.

5. The apparatus according to claim 4, wherein the vanes have an arcuate shape and the top of the arc is pointed in the direction of rotation of the shaft.

6. The apparatus according to claim 4, wherein the vanes have tapered ends.